

A-Train aerosol observations – preliminary comparisons with AeroCom models and pathways to observationally based all-sky estimates

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We have developed a technique for combining CALIOP aerosol backscatter, MODIS spectral AOD (aerosol optical depth), and OMI AAOD (absorption aerosol optical depth) retrievals for the purpose of estimating full spectral sets of aerosol radiative properties, and ultimately for calculating the 3-D distribution of direct aerosol radiative forcing. We present results using one year of data collected in 2007 and show comparisons of the aerosol radiative property estimates to collocated AERONET retrievals. Use of the recently released MODIS Collection 6 data for aerosol optical depths derived with the dark target and deep blue algorithms has extended the coverage of the multi-sensor estimates towards higher latitudes.

We compare the spatio-temporal distribution of our multi-sensor aerosol retrievals and calculations of seasonal clear-sky aerosol radiative forcing based on the aerosol retrievals to values derived from four models that participated in the latest AeroCom model intercomparison initiative. We find significant inter-model differences, in particular for the aerosol single scattering albedo, which can be evaluated using the multi-sensor A-Train retrievals.

We discuss the major challenges that exist in extending our clear-sky results to all-sky conditions. On the basis of comparisons to suborbital measurements, we present some of the limitations of the MODIS and CALIOP retrievals in the presence of adjacent or underlying clouds. Strategies for meeting these challenges are discussed.